Key Findings

1. MOX completion is the lowest cost alternative and best solution
2. Changing disposal strategies comes with significant risk and strategic penalties
3. Dilution is not a viable strategy as the U.S. currently lacks an operating facility to store and secure the resulting plutonium-laden material
4. Dilution option increases costs related to safety and local security

Changing Pu Disposition would be costly and a major policy reversal that is based on 20 years of study and analysis, and the U.S. government selected the MOX Fuel approach in 2000 as the solution for Pu Disposition.

In addition, the sale of MOX to commercial nuclear power companies will result in net revenues to the U.S. Treasury of nearly $1 billion. The MOX fuel will generate an estimated 285 billion kilowatt-hours of electricity, enough to power 26 million homes for a year, for an economic value of approximately $35 billion.

Executive Summary – High Bridge Associates, Inc. Final Report

The U.S. Mixed Oxide (MOX) disposal program is being challenged by critics advocating for a switch to a process referred to as Dilution and/or Downblending. In response to this alternate process recommendation, the CBI-AREVA MOX Services Board of Governors retained High Bridge Associates, Inc., a reputable nuclear construction consulting firm, to conduct an independent review of a 2015 Aerospace Corporation study regarding the costs of the MOX Program vs Dilution. High Bridge found clear deficiencies in the conclusions, noting flawed analysis, technical deficiencies, and failure to follow accepted industry cost estimating standards.

1. **MOX completion is the lowest cost alternative and best solution:** High Bridge found the Aerospace report used "technically flawed" non-standard accounting methodology in its cost analysis, using escalated real-year dollars, which artificially inflated total MOX project costs. If standard practices were used, the total estimated project costs of MOX vs Dilution would have been nearly comparable at $19B for MOX Life Cycle Cost (Option 1) and $20B for Dilution (Option 4).
2. **Changing disposal strategies comes with significant risk and strategic penalties:** Dilution comes with "political, programmatic and regulatory uncertainties", which will inevitably increase the prospect of additional program delays and risk of rising costs, and the MOX option presents significant technical and regulatory advantages over the Dilution option. These include complying with the terms of the 2000 Plutonium Management and Disposition Agreement (PDMA) — a key non-proliferation agreement with Russia that commits the U.S. and Russia to each dispose 34 metric tons of excess weapons-grade plutonium with MOX designated as the disposal method.
3. **Dilution is not a viable strategy as the U.S. currently lacks an operating facility to store and secure the resulting plutonium-laden material:** The Waste Isolation Pilot Plan (WIPP) in New Mexico is the only U.S. facility that could, theoretically, hold Diluted plutonium. The U.S. has identified 51 metric tons of excess plutonium for disposal which would exceed the WIPP's legislated volume capacity by approximately 48 percent. Moreover, in accepting the weapons grade plutonium, the facility's government licenses would have to be changed. Reconstructing the facility to increase its capacity and to allow the acceptance of plutonium would require Congressional engagement. In addition, since WIPP is the only repository for accepting DOE nuclear waste, either the facility would have to be greatly expanded or postpone other high profile projects focusing on nuclear materials from other clean-up sites currently planned for the WIPP.
4. **Dilution option increases costs related to safety and local security:** Switching from MOX to the Dilution option would greatly increase the number of transit shipments on trucks required through localities, driving up risks to communities and increasing costs to ensure the safety and security of those shipments. With MOX, there would be approximately 80 shipments, while the Dilution option would require approximately 2,200 truck shipments.

Comparison of Plutonium Disposition Program Alternatives Approximate Revenue, Cost Impact, and Value Contribution Metrics MOX Fuel Sales, Clean Energy, and GNP Parameters Option 1 MOX Fuel vs. Option 4 Dilution/Downblend

#	Option 1 –MOX Fuel		Option 4 – Dilution/Downblend	
	Program Element		Program Element	
01	Metric Tonnes of Plutonium PU 239	34	34	Metric Tonnes of Plutonium PU 239
02	Pounds of Plutonium PU 239	74,956	74,956	Pounds of Plutonium PU 239
03	Compliance with PDMA and Isotopic changed achieved	Yes	No	Compliance with PDMA and Isotopic changed achieved
04	Approx. Product Output: Nuclear Fuel PWR Assembly Approx. 15" x 15" x 14 ' Long Each Containing Approx. 200 Titanium Clad Fuel Rods	2K	97K	Approx. Waste Form Output: Plutonium Diluted/Mixed with Stardust Inert Material in 6" Diameter x 2' Long Container Packed Inside a 55 Gallon Drum
05	Approx. new revenue to US Treasury for MOX Sales	$1B	$0	Approx. new revenue to US Treasury for MOX Sales
06	Approximate Number of Tractor Trailer Shipments in Armored Casks with 4 Fuel Assemblies/Cask and 2 Casks/Truck	80	2,300	Approximate Number of Tractor Trailer Shipments in TRUPACT-II Containers with 14 Fuel Assemblies/ Container and 3 Containers/Truck
07	Approx. WIPP storage capacity volume consumed	~0	20,200 Cu Meters	Approx. WIPP storage capacity volume consumed
08	Approx. megawatt hours of clean energy produced	285M	0	Approx. megawatt hours of clean energy produced
09	Approx. value of clean electricity produced	$35B	$0	Approx. value of clean electricity produced
10	Approx. State/local tax revenue generated	>$5B	$0	Approx. State/local tax revenue generated
11	Approx. MOX Life Cycle costs	$19.4B	$19.9B	Approx. Downblend program costs
12	Approx. US Jobs created over 20 years	>10K	0	Approx. US Jobs created over 20 years
13	Avoided Carbon Emissions	335M Tons	0	Avoided Carbon Emissions
14	Avoided NOx Gas Emissions	420K Tons	0	Avoided NOx Gas Emissions
15	Avoided SO2 Gas Emissions	675K Tons	0	Avoided SO2 Gas Emissions

NOTE: The values identified in this Exhibit are Approximate based on the analysis performed during the High Bridge Phase 2 Report Review.